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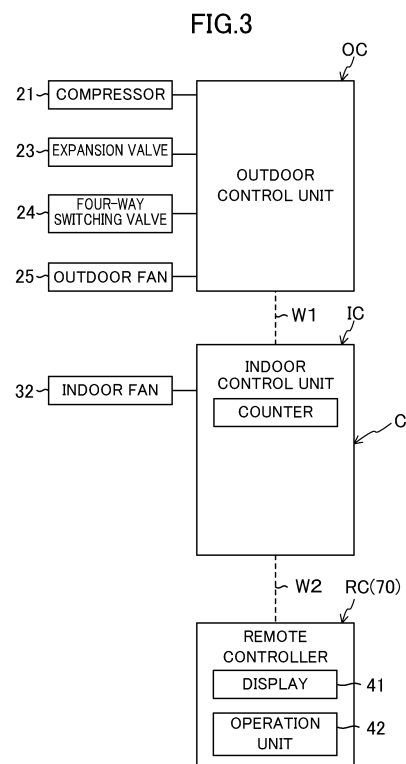
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(54) **AIR-CONDITIONING DEVICE, MANAGEMENT DEVICE, AND PROGRAM**

(57) An air conditioner (10) includes a notification unit (41) configured to notify a user of first information if power supply to the air conditioner (10) is restarted after a time equal to or longer than a predetermined time has elapsed since stopping of the power supply to the air conditioner (10).



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Description

TECHNICAL FIELD

[0001] The present disclosure relates to an air conditioner, a management device, and a program.

BACKGROUND ART

[0002] An air conditioner disclosed in Patent Document 1 includes a refrigerant leakage sensor. When power supply from an external source to the air conditioner stops, a liquid crystal display of a remote controller displays information indicating that refrigerant leakage is undetectable.

CITATION LIST

PATENT DOCUMENT

[0003] Patent Document 1: Japanese Unexamined Patent Publication No. 2016-191506

SUMMARY OF THE INVENTION

TECHNICAL PROBLEM

[0004] Stopping of the power supply to the air conditioner for relatively longer time results in higher risk due to the refrigerant leakage. This is because in such a case, the refrigerant leakage sensor does not function, or it is impossible to execute an operation, such as measures against the refrigerant leakage, or other operations. For example, during an intermediate period, an air conditioner (10) may be left unused for a long time, and a user may keep the air conditioner unplugged for a long period in consideration of energy conservation. In this case, the risk due to the refrigerant leakage becomes considerably high. Thus, it is desirable to let a user know the risk of the refrigerant leakage that may occur in such a relatively long time.

[0005] It is an object of the present disclosure to make it possible to have a user recognize the risk when the power supply to an air conditioner has been stopped for a relatively long time.

SOLUTION TO THE PROBLEM

[0006] A first aspect is directed to an air conditioner including: a notification unit (41) configured to notify a user of first information if power supply to the air conditioner (10) is restarted after a time equal to or longer than a predetermined time has elapsed since stopping of the power supply to the air conditioner (10).

[0007] According to the first aspect, a notification unit (41) notifies a user of first information if power supply to the air conditioner (10) is restarted after a time equal to or longer than a predetermined time has elapsed since

stopping of the power supply to the air conditioner (10). The first information makes it possible for the user to recognize the risk. Specifically, if the power supply to the air conditioner (10) has been stopped by the user for a relatively long time, the user can recognize the risk more strongly by being notified of the first information than by being given a notification at the point of time when the power supply is stopped as in Patent Document 1.

[0008] A second aspect is an embodiment of the first aspect. The air conditioner of the second aspect further includes:

a control unit (C) configured to prohibit operation of the air conditioner (10) if the power supply to the air conditioner (10) is restarted after a time equal to or longer than the predetermined time has elapsed since the stopping of the power supply to the air conditioner (10).

[0009] According to the second aspect, a control unit (C) prohibits operation of the air conditioner (10) if the power supply to the air conditioner (10) is restarted after a time equal to or longer than the predetermined time has elapsed since the stopping of the power supply to the air conditioner (10). It is thus possible to prevent the air conditioner (10) from being operated at high risk.

[0010] A third aspect is an embodiment of the first or second aspect. In the third aspect, the predetermined time is 200 hours.

[0011] For example, if the user unplugs the air conditioner (10) during an intermediate period, the period when the power supply to the air conditioner (10) is stopped tends to exceed 200 hours. Thus, according to the third aspect, the predetermined time is set to be 200 hours. It is thus possible to make the user recognize the risk that arises when power supply to the air conditioner is stopped for a relatively long time, in the case in which the power supply to the air conditioner (10) is restarted after 200 or more hours from the user's unplugging the air conditioner (10) in an intermediate period, for example, not a relatively short time power supply stop for relocation of the air conditioner (10).

[0012] A fourth aspect is an embodiment of the second aspect. In the fourth aspect, the control unit (C) cancels prohibition of the operation of the air conditioner (10) when a command associated with operation of a manufacturer, a distributor, or a service provider is input to the control unit (C).

[0013] The control unit (C) according to the fourth aspect cancels prohibition of the operation of the air conditioner (10) on condition that a command associated with the operation of the manufacturer, the distributor, or the service provider is input. It is thus possible to keep the air conditioner (10) from being operated without inspections of the air conditioner (10) or any other measures by these workers.

[0014] A fifth aspect is an embodiment of the second aspect. In the fifth aspect, the control unit (C) cancels prohibition of the operation of the air conditioner (10) when a predetermined cancel code is input to the control unit (C).

[0015] The control unit (C) according to the fifth aspect cancels prohibition of the operation of the air conditioner (10) on condition that a predetermined cancel code is input. For example, the user contacts the service provider or any other operator to get the predetermined cancel code. The operation of the air conditioner (10) is prohibited until the cancel code which the user or any other person has gotten is entered into the control unit (C).

[0016] A sixth aspect is an embodiment of the fifth aspect. In the sixth aspect, the cancel code is information which will be given to the user by a manufacturer, a distributor, or a service provider after the power supply to the air conditioner (10) is restarted.

[0017] According to the sixth aspect, the operation of the air conditioner (10) is prohibited until the cancel code which has given to the user by the manufacturer, the distributor, or the service provider is entered into the control unit (C).

[0018] A seventh aspect is an embodiment of any one of the first to sixth aspects. In the seventh aspect, the first information includes information indicating that a time equal to or longer than the predetermined time has elapsed since the stopping of the power supply to the air conditioner (10).

[0019] According to the seventh aspect, the user can know by the first information that a time equal to or longer than the predetermined time has elapsed since the stopping of the power supply to the air conditioner (10). It is thus possible for the user to recognize that the risk is relatively high.

[0020] An eighth aspect is an embodiment of any one of the first to seventh aspects. In the eighth aspect, the first information includes information urging contact with a manufacturer, a distributor, or a service provider.

[0021] According to the eighth aspect, the user gets the first information, so that it is possible to urge the user to contact the manufacturer, the distributor, or the service provider.

[0022] A ninth aspect is an embodiment of any one of the first to eighth aspects. In the ninth aspect, the first information includes a contact address of a manufacturer, a distributor, or a service provider.

[0023] According to the ninth aspect, the user can know the contact address of the manufacturer, the distributor, or the service provider by the first information.

[0024] A tenth aspect is an embodiment of any one of the first to ninth aspects. The air conditioner of the tenth aspect further includes: a sensor (35) configured to detect leakage of a refrigerant.

[0025] According to the tenth aspect, if the power supply to the air conditioner (10) is stopped for a time equal to or longer than the predetermined time, the sensor (35) configured to detect the refrigerant leakage does not work, which increases the risk. The first information makes it possible for the user to recognize this risk.

[0026] An eleventh aspect is directed to a management device for an air conditioner. The management

device includes: a notification unit (41) configured to notify a user of first information if power supply to the air conditioner (10) is restarted after a time equal to or longer than a predetermined time has elapsed since stopping of the power supply to the air conditioner (10).

[0027] A twelfth aspect is directed to a program that executes a process for notifying a user of first information if power supply to an air conditioner (10) is restarted after a time equal to or longer than a predetermined time has elapsed since stopping of the power supply to the air conditioner (10).

BRIEF DESCRIPTION OF THE DRAWINGS

[0028]

FIG. 1 is a schematic piping system diagram illustrating an air conditioner according to an embodiment.

FIG. 2 is a schematic perspective view of the air conditioner.

FIG. 3 is a block diagram illustrating the air conditioner.

FIG. 4 is a schematic diagram showing a power line of the air conditioner.

FIG. 5 is a flowchart of control to be performed when the power supply to the air conditioner stops.

FIG. 6 is a flowchart showing work and control to be performed after operation of the air conditioner is prohibited.

FIG. 7 is a schematic diagram illustrating an air-conditioning system of a first variation.

FIG. 8 is a schematic diagram illustrating an air-conditioning system of a second variation.

FIG. 9 is a block diagram illustrating an air conditioner of a third variation.

FIG. 10 is a flowchart of control to be performed when the power supply to an air conditioner of a fourth variation stops.

FIG. 11 is a block diagram illustrating a management device of type A of a fifth variation.

FIG. 12 is a block diagram illustrating a management device of type B of the fifth variation.

DESCRIPTION OF EMBODIMENTS

[0029] Embodiments of the present disclosure will be described in detail below with reference to the drawings. The present disclosure is not limited to the embodiments shown below, and various changes can be made within the scope without departing from the technical concept of the present disclosure. Each of the drawings is intended to illustrate the present disclosure conceptually, and dimensions, ratios, or numbers may be exaggerated or simplified as necessary for the sake of ease of understanding.

<<Embodiment>>

(1) General Configuration of Air Conditioner

[0030] FIG. 1 is a schematic piping system diagram illustrating an air conditioner (10). FIG. 2 is a schematic perspective view of the air conditioner (10).

[0031] The air conditioner (10) controls the temperature of air in a target space. The target space is an indoor space (I). The air conditioner (10) performs a cooling operation and a heating operation. In the cooling operation, the air conditioner (10) cools the air in the indoor space (I). In the heating operation, the air conditioner (10) heats the air in the indoor space (I).

[0032] The air conditioner (10) includes a refrigerant circuit (11). The refrigerant circuit (11) is filled with a refrigerant. The refrigerant circuit (11) circulates the refrigerant therethrough to perform a refrigeration cycle.

[0033] The air conditioner (10) includes an outdoor unit (20), an indoor unit (30), a first connection pipe (12), and a second connection pipe (13). The air conditioner (10) is of a pair type that includes one outdoor unit (20) and one indoor unit (30). The first connection pipe (12) is a gas connection pipe, and a second connection pipe (13) is a liquid connection pipe.

[0034] The outdoor unit (20) is installed outdoors. The outdoor unit (20) includes an outdoor casing (20a) and an outdoor element housed in the outdoor casing (20a). The outdoor element includes a compressor (21), an outdoor heat exchanger (22), an expansion valve (23), a four-way switching valve (24), and an outdoor fan (25).

[0035] The compressor (21) is, for example, a rotary compressor of an oscillating piston type, a rotary type, or a scroll type. The outdoor heat exchanger (22) is a fin-and-tube heat exchanger. The four-way switching valve (24) switches between a first state (the state indicated by the solid curves in FIG. 1) and a second state (the state indicated by the broken curves in FIG. 1). The four-way switching valve (24) in the first state makes a discharge portion of the compressor (21) and a gas end of the outdoor heat exchanger (22) communicate with each other, and makes a suction portion of the compressor (21) and the first connection pipe (12) communicate with each other. The four-way switching valve (24) in the second state makes the discharge portion of the compressor (21) and the first connection pipe (12) communicate with each other, and makes the suction portion of the compressor (21) and the gas end of the outdoor heat exchanger (22) communicate with each other. The outdoor fan (25) is a propeller fan.

[0036] The indoor unit (30) includes an indoor casing (30a) and an indoor element housed in the indoor casing (30a). The indoor element includes an indoor heat exchanger (31) and an indoor fan (32). The indoor heat exchanger (31) is a fin-and-tube heat exchanger. The indoor fan (32) is a cross-flow fan.

(1-1) Refrigerant

[0037] The refrigerant in the refrigerant circuit (11) is a flammable refrigerant. The refrigerant in this example is propane (R290), which is a highly flammable natural refrigerant. The natural refrigerant is a refrigerant having an ozone depletion potential of zero, a low global warming potential, and a low environmental load. The flammable refrigerant may be, for example, ammonia (R717), which is a natural refrigerant. The refrigerant may also be methane (R50), ethane (R170), butane (R600), or isobutane (R600a), which is a highly flammable natural refrigerant. The refrigerant may be difluoromethane (R32), 2,3,3,3-tetrafluoropropene (HFO-1234yf), or 1,3,3,3-tetrafluoropropene (HFO-1234ze). The refrigerant may be a single component refrigerant or a refrigerant mixture in which another refrigerant is mixed.

(1-2) Refrigerant Leakage Sensor

[0038] The air conditioner (10) includes a refrigerant leakage sensor (35). The refrigerant leakage sensor (35) is a sensor for detecting leakage of the refrigerant. The refrigerant leakage sensor (35) is activated by supplying electric power to the air conditioner (10) from an external source. The refrigerant leakage sensor (35) is disposed inside the indoor casing (30a) of the indoor unit (30). The refrigerant leakage sensor (35) may be disposed in the indoor space (I). When a condition in which the concentration of the refrigerant around the refrigerant leakage sensor (35) exceeds a predetermined value is satisfied, the refrigerant leakage sensor (35) outputs a signal indicating that the refrigerant has leaked. The refrigerant leakage sensor (35) may include an alarm configured to give an alarm when the above condition is satisfied.

(1-3) Control Unit

[0039] As illustrated in FIG. 3, a control unit (C) includes an indoor control unit (IC), an outdoor control unit (OC), and a remote controller (RC). The control unit (C) controls the air conditioner (10).

[0040] The outdoor control unit (OC) is provided for the outdoor unit (20). The outdoor control unit (OC) is disposed inside the outdoor casing (20a). The outdoor control unit (OC) controls the compressor (21), the expansion valve (23), the four-way switching valve (24), and the outdoor fan (25). Strictly speaking, the outdoor control unit (OC) controls start and stop of the compressor (21), the number of revolutions of the compressor (21), the opening degree of the expansion valve (23), the state of the four-way switching valve (24), start and stop of the outdoor fan (25), and the number of revolutions of the outdoor fan (25).

[0041] The indoor control unit (IC) is provided for the indoor unit (30). The indoor control unit (IC) is disposed inside the indoor casing (30a). The indoor control unit (IC) controls the indoor fan (32). Specifically, the indoor con-

trol unit (IC) controls start and stop of the indoor fan (32) and the number of revolutions of the indoor fan (32). The indoor control unit (IC) receives a signal output from the refrigerant leakage sensor (35).

[0042] The indoor control unit (IC) and the outdoor control unit (OC) are connected to each other by a first transmission line (W1) which is wired or wireless. The indoor control unit (IC) and the outdoor control unit (OC) are configured to be able to transmit and receive signals from each other.

[0043] The remote controller (RC) is installed in the indoor space (I). The remote controller (RC) is a unit that allows a user or the like to switch the operation of the air conditioner (10). The remote controller (RC) and the indoor control unit (IC) are connected to each other by a second transmission line (W2) which is wireless or wired. The remote controller (RC) and the indoor control unit (IC) are configured to be able to transmit and receive signals from each other.

[0044] The remote controller (RC) includes a display (41) and an operation unit (42). The display (41) is an example of a notification unit of the present disclosure. The display (41) is a display such as a liquid crystal display. The operation unit (42) includes a button and the like operated by a user. A touch panel may serve as both the display (41) and the operation unit (42).

[0045] The remote controller (RC) outputs an operation command to the indoor control unit (IC) in response to the operation of the operation unit (42). The operation command includes a command for switching start and stop of the air conditioner (10), a command for switching the operating mode (the cooling operation or the heating operation) of the air conditioner (10), and a command for switching a target temperature (set temperature) of the indoor space (I).

[0046] The indoor control unit (IC), the outdoor control unit (OC), and the remote controller (RC) each include a micro control unit (MCU), an electric circuit, and an electronic circuit. The MCU includes a central processing unit (CPU), a memory, and a communication interface. The memory stores various programs to be executed by the CPU.

[0047] The programs execute a process for notifying the user of first information when power supply to the air conditioner (10) is restarted after a time equal to or longer than a predetermined time has elapsed since the stopping of the power supply to the air conditioner (10). Specifically, the programs execute the processes of Steps S16 to S18 to be described in detail later.

[0048] The management device (70) of the present disclosure includes the control unit (C) and the display (41) which serves as the notification unit.

(2) Operation

[0049] The air conditioner (10) performs a cooling operation and a heating operation.

[0050] In the cooling operation, the four-way switching

valve (24) is brought into the first state. The refrigerant compressed in the compressor (21) dissipates heat in the outdoor heat exchanger (22) and is decompressed by the expansion valve (23). The refrigerant that has been decompressed evaporates in the indoor heat exchanger (31). The air cooled in the indoor heat exchanger (31) is supplied to the indoor space (I). The refrigerant that has evaporated in the indoor heat exchanger (31) is sucked into the compressor (21).

[0051] In the heating operation, the four-way switching valve (24) is brought into the second state. In the heating operation, the refrigerant compressed in the compressor (21) dissipates heat in the indoor heat exchanger (31) and is decompressed by the expansion valve (23). The air heated in the indoor heat exchanger (31) is supplied to the indoor space (I). The refrigerant that has been decompressed evaporates in the outdoor heat exchanger (22), and is then sucked into the compressor (21).

(3) Configuration of Power Supply System of Air Conditioner

(3-1) Power Line

[0052] As illustrated in FIGS. 2 and 5, the indoor unit (30) includes a power supply line (50) and a plug (51). The plug (51) is inserted in a socket (5) facing the indoor space (I). Accordingly, an external power source (100), which is a commercial power source, and the air conditioner (10) are connected to each other via the power supply line (50), so that power is supplied from the external power source (100) to the air conditioner (10).

[0053] Strictly speaking, the external power source (100) and the indoor control unit (IC) are connected to each other via the power supply line (50), and the indoor control unit (IC) and the outdoor control unit (OC) are connected to each other via a junction line (52). The indoor control unit (IC) supplies power to the indoor element. The indoor control unit (IC) supplies power to the outdoor element. Both of the indoor unit (30) and the outdoor unit (20) are energized while power is supplied from the external power source (100) to the air conditioner (10) as described above.

[0054] The air conditioner (10) includes a detector (53), a first internal power source (54), and a switching circuit (55).

[0055] The detector (53) is provided on the power supply line (50). The detector (53) detects whether or not power is being supplied from the external power source (100) to the air conditioner (10).

[0056] The first internal power source (54) is an auxiliary power source for the air conditioner (10). The first internal power source (54) is disposed inside the indoor casing (30a). The first internal power source (54) is configured as a battery or a storage battery. The first internal power source (54) is connected to the indoor control unit (IC) via an auxiliary power supply line (56). If power is not being supplied from the external power

source (100) to the air conditioner (10), the first internal power source (54) supplies power to the air conditioner (10) (strictly speaking, the indoor control unit (IC)).

[0057] The switching circuit (55) changes the state of energization of the auxiliary power supply line (56). When the detector (53) detects that power is not being supplied from the external power source (100) to the air conditioner (10), the switching circuit (55) is turned on. The first internal power source (54) and the indoor control unit (IC) are energized when the switching circuit (55) is turned on. When the detector (53) detects that power is being supplied from the external power source (100) to the air conditioner (10), the switching circuit (55) is turned off. The first internal power source (54) and the indoor control unit (IC) are not energized when the switching circuit (55) is turned off.

(3-2) Counter

[0058] As illustrated in FIG. 3, the indoor control unit (IC) includes a counter (57) as a timer. The counter (57) measures the time during which power is not being supplied from the external power source (100) to the air conditioner (10) (hereinafter referred to also as the "first time"). For example, the counter (57) measures the time during which the external power source (100) and the indoor control unit (IC) are not energized, as the first time. Specifically, for example, the counter (57) measures, as the first time, the time during which the switching circuit (55) is on, in other words, the time during which the first internal power source (54) and the indoor control unit (IC) are energized.

(3-3) Configuration of Control Unit for Power Supply

[0059] The control unit (C) determines that a time equal to or longer than a predetermined time T_s has elapsed since stopping of the power supply from the external power source (100) to the air conditioner (10). Here, the predetermined time T_s is set to be 200 hours. The predetermined time T_s is preferably 200 or more, but may be shorter than 200 hours. Any time can be set as the predetermined time T_s in the control unit (C). The predetermined time T_s may be set at the time of shipment of the product or may be changeable by the operation unit, such as the remote controller (RC).

[0060] The display (41) notifies the user of the first information if the power supply from the external power source (100) to the air conditioner (10) is restarted after the time equal to or longer than the predetermined time T_s has elapsed since the stopping of the power supply from the external power source (100) to the air conditioner (10).

[0061] The first information includes information A indicating that a time equal to or longer than a predetermined time has elapsed since stopping of the power supply from the external power source (100) to the air conditioner (10). For example, the information A may be

shown on the display (41) as a message, such as "200 or more hours have elapsed since stopping of power supply" and "power supply has been stopped for 200 or more hours."

[0062] The first information includes information B urging contact with a manufacturer, a distributor, or a service provider. For example, the information B may be shown on the display (41) as a message, such as "contact the manufacturer X," "contact the distributor Y," and "contact the service provider."

[0063] The first information includes information C, which is a contact address of the manufacturer, the distributor, or the service provider. For example, the information C may be shown on the display as strings of characters including a telephone number, a mail address, a postal address, a URL, and the like. The information C may be a QR code (registered trademark) including a URL that shows the contact address.

[0064] If the power supply from the external power source (100) to the air conditioner (10) is restarted after the time equal to or longer than the predetermined time T_s has elapsed since stopping of the power supply from the external power source (100) to the air conditioner (10), the control unit (C) prohibits operation of the air conditioner (10). Specifically, if the power supply is restarted upon satisfaction of this condition, the control unit (C) makes the air conditioner (10) in the locked state. Once the air conditioner (10) is in the locked state, the air conditioner (10) cannot start operation even if the user operates the remote controller (RC), for example, to transmit a command to operate the air conditioner (10).

(4) Control Operation Related to Power Supply

[0065] The control operation related to the power supply will be described in detail with reference to FIGS. 2 to 5.

[0066] For example, a user may remove the plug (51) of the power supply line of the indoor unit (30) from the socket (5) in an intermediate period such as spring or fall. The plug (51) is removed from the socket (5) because doing so can reduce standby power consumption in the intermediate period when the air conditioner (10) is less likely to be used.

[0067] The refrigerant leakage sensor (35) does not work if no power is supplied in this state from the external power source (100) to the air conditioner (10). Thus, if leakage of the refrigerant through a refrigerant pipe or a joint of a refrigerant pipe occurs, it may incur the risk of ignition, for example. Particularly in this embodiment, there is a greater risk of ignition because propane, which is flammable, is used as the refrigerant. Thus, in this embodiment, the following control is performed to lower such a risk when the power supply to the air conditioner (10) stops for a relatively long period.

[0068] For example, in Step 11, power supply from the external power source (100) to the air conditioner (10) is stopped when the user removes the plug (51) from the

socket (5).

[0069] In Step S12, the detector (53) detects that the power supply from the external power source (100) to the air conditioner (10) has stopped.

[0070] In Step S13, the switching circuit (55) is turned on, and the first internal power source (54) and the indoor control unit (IC) are energized. As a result, power is supplied to the indoor control unit (IC) from the first internal power source (54).

[0071] In step S14, the counter (57) measures the first time during which the power supply from the external power source (100) to the air conditioner (10) stops. The first time is not a cumulative time but a continuous time.

[0072] In Step S15, if the power supply from the external power source (100) to the air conditioner (10) is restarted, the process proceeds to Step S16.

[0073] In Step S16, the control unit (C) determines whether or not the first time is a time equal to or longer than the predetermined time T_s (200 hours in this example). As described above, it is highly likely that the first time is the time equal to or longer than the predetermined time T_s if the user removes the plug from the socket (5). In Step S16, if the first time is the time equal to or longer than the predetermined time T_s , the process proceeds to Steps S17 and S18.

[0074] In Step S17, the control unit (C) makes the air conditioner (10) in the locked state to prohibit the operation of the air conditioner (10). It is thus impossible to operate the air conditioner (10) if the first time is the time equal to or longer than the predetermined time T_s and the power supply from the external power source (100) to the air conditioner (10) is restarted after the first time. It is therefore possible to prevent the air conditioner (10) at a high risk of refrigerant leakage from being operated without measures.

[0075] In Step S18, a signal is output from the indoor control unit (IC) to the remote controller (RC). When the remote controller (RC) receives the signal, the display (41) displays the first information. The first information includes the information A, the information B, and the information C described above.

[0076] The user can recognize the high risk due to refrigerant leakage at the current moment, when the user see the information A indicating that a time equal to or longer than a predetermined time has elapsed since stopping of the power supply from the external power source (100) to the air conditioner (10).

[0077] When the user see the information B urging contact with a manufacturer, a distributor, or a service provider, the user can recognize the need to make contact with these workers.

[0078] Checking the information C including the contact address of the manufacturer, the distributor, or the service provider makes it easy for the user to make contact with these workers. Measures which will be described in detail later can be taken thereafter.

[0079] In Step S16, if the first time is shorter than the predetermined time T_s , the processes in Steps S17 and

S18 are not executed. Thus, the operation of the air conditioner (10) is not prohibited, and the user is not notified of the first information. As can be seen, the air conditioner (10) can perform a normal operation after, for example, a circuit breaker has tripped in a house or a power outage has occurred, if the time of stopping of the power supply to the air conditioner (10) is shorter than the predetermined time T_s .

(5) Procedures After Restart of Power Supply

[0080] The work and control shown in FIG. 6 are performed after the operation of the air conditioner (10) is prohibited in Step S17 and the user is notified of the first information in Step S18.

[0081] In Step S21, the user makes contact with a worker in the manufacturer, the distributor, or the service provider to let them know that the first information has been given.

[0082] In Step S22, the worker who received the contact checks the air conditioner (10). Specifically, the worker checks for any problem in the air conditioner (10) or a refrigerant leakage in the indoor space (I), for example. If any problem or a refrigerant leakage is found, the worker takes measures against these problems.

[0083] In Step S23, the user enters a cancel code into the control unit (C). The cancel code as used herein is a code for cancelling the prohibition of the operation of the air conditioner (10). The cancel code is information given by the manufacturer, the distributor, or the service provider to the user. The user who received the cancel code operates the remote controller (RC) to enter the cancel code into the control unit (C). The worker may enter the cancel code into the control unit (C).

[0084] In Step S24, the air conditioner (10) is unlocked when the cancel code is entered into the control unit (C). After that, it is possible to perform a normal operation of the air conditioner (10).

(6) Advantages of Embodiment

[0085] (6-1)

The air conditioner (10) includes the display (41) which is the notification unit configured to notify the user of the first information if the power supply to the external power source (100) of the air conditioner (10) is restarted after the time equal to or longer than the predetermined time T_s has elapsed since stopping of the power supply to the air conditioner (10).

[0086] It is thus possible to make the user recognize the risk at the restart of the power supply to the air conditioner (10) if the risk has increased because the user removed the plug (51) of the air conditioner (10) from the socket (5). Accordingly, predetermined measures can be taken thereafter.

[0087] On the other hand, the display (41) does not notify the user of the first information, if the time of stopping of the power supply to the air conditioner (10)

is shorter than the predetermined time T_s when a circuit breaker has tripped in a house or a power outage has occurred. It is thus possible to prevent a decrease in usability of the air conditioner (10).

[0088] (6-2)

The air conditioner (10) includes the control unit (C) configured to prohibit the operation of the air conditioner (10) if the power supply to the air conditioner (10) is restarted after the time equal to or longer than the predetermined time T_s has elapsed since stopping of the power supply to the air conditioner (10).

[0089] It is thus possible to reliably prevent the air conditioner (10) from being operated in the same high-risk state, if the risk has increased because the user removed the plug (51) of the air conditioner (10) from the socket (5). Accordingly, predetermined measures can be taken before the operation of the air conditioner (10).

[0090] On the other hand, the air conditioner (10) can be operated without measures, if the time of stopping of the power supply to the air conditioner (10) is shorter than the predetermined time T_s when a circuit breaker has tripped in a house or a power outage has occurred. It is thus possible to prevent a decrease in usability of the air conditioner (10).

[0091] (6-3)

The predetermined time T_s for determining whether to give the first information to the user and whether to prohibit the operation of the air conditioner (10) is 200 hours. In general, a power outage caused by an earthquake or other similar situation will not last for more than 200 hours in most cases. On the other hand, the time of the state of the air conditioner (10) with its plug (51) removed from the socket (5) for power savings in the intermediate period such as spring and fall is 200 hours or more in general. It is thus possible to reliably prevent the first information from being given or the air conditioner (10) from brought into the locked state as a result of a power outage or other similar situation, by setting the predetermined time T_s to be 200 hours. It is thus possible to reliably prevent a decrease in usability of the air conditioner (10).

[0092] (6-4)

The control unit (C) cancels the prohibition of the operation of the air conditioner (10) when a predetermined cancel code is input to the control unit (C) (Steps S23 and S24).

[0093] It is thus possible to reliably prevent the air conditioner (10) from performing a normal operation after the operation of the air conditioner (10) has been locked.

[0094] The cancel code is information which will be given to the user by the manufacturer, the distributor, or the service provider.

[0095] It is thus possible to reliably prevent the air conditioner (10) from performing a normal operation before these workers or other operators finish checking and taking measures, for example.

[0096] (6-5)

The first information includes information indicating that a time equal to or longer than a predetermined time has elapsed since stopping of the power supply to the air conditioner (10). It is thus possible for the user to recognize reliably that the risk has been increased by the removal of the plug (51) or other situations.

[0097] The first information includes information urging contact with a manufacturer, a distributor, or a service provider. It is thus possible to urge the user given the first information to make contact with these workers.

[0098] The first information includes a contact address of the manufacturer, the distributor, or the service provider. It is thus possible for the user given the first information to make contact with these workers easily.

(7) Variations

[0099] The above embodiment may be implemented as the following variations. In the following description, differences from the embodiment will be described in principle.

(7-1) First Variation

[0100] As shown in FIG. 7, air conditioners (10) of a first variation are connected to an operator terminal device (60) via a network (N). The operator terminal device (60) includes a server and a monitor. The operator terminal device is operable by a manufacturer, a distributor, or a service provider. The air conditioners (10) and the operator terminal device (60) form an air-conditioning system.

[0101] If the time during which the power supply to one of the air conditioners (10) stops is equal to or longer than a predetermined time T_s , a control unit (C) of the one of the air conditioners (10) transmits a signal indicating that the risk in the air conditioner (10) is high to the operator terminal device (60) via the network (N). This signal includes ID information of the target air conditioner (10). Thus, the manufacturer, the distributor, or the service provider can know the higher risk in a specific air conditioner (10) without the need to wait for the contact from the user.

[0102] The worker checks the specified air conditioner (10), and then operates the operator terminal device (60). A command is sent by this operation to the specified air conditioner (10) from the operator terminal device (60). When the command is input to the control unit (C) of the air conditioner (10), the control unit (C) cancels the prohibition of the operation of the air conditioner (10). After that, the air conditioner (10) can perform an operation.

[0103] As can be seen, in the first variation, the control unit (C) cancels the prohibition of the operation of the air conditioner (10) when a command associated with the operation of the manufacturer, the distributor, or the service provider is input to the control unit (C). It is thus possible to reliably prevent the situation in which the

prohibition of the operation of the air conditioner (10) is canceled by the user's operation.

(7-2) Second Variation

[0104] In a second variation shown in FIG. 8, air conditioners (10) are connected to a network (N), and a first timer (61) connected to the network (N) acquires the first time. The first timer (61) is part of a management device of the present disclosure. The air conditioners (10) and the first timer (61) form an air-conditioning system.

[0105] For example, the first timer (61) acquires a first time of day at which the power supply from an external power source (100) to one of the air conditioners (10) stopped, and a second time of day at which the power supply from the external power source (100) to the one of the air conditioners (10) was restarted, based on a signal transmitted from the one of the air conditioners (10). The first timer (61) obtains the first time based on the first time of day and the second time of day. The first time is transmitted to the control unit (C) of the one of the air conditioners (10) via the network (N). The control unit (C) makes the determination in Step S16 described above, based on the first time.

[0106] In the second variation, control of the present disclosure can be performed without a first internal power source (54) for each air conditioner (10).

(7-3) Third Variation

[0107] In a third variation, the remote controller (RC) measures the first time. As shown in FIG. 9, the remote controller (RC) is provided with a second timer (43) and a second internal power source (44). For example, the second timer (43) acquires a first time of day at which the power supply from an external power source (100) to one of the air conditioners (10) stopped, and a second time of day at which the power supply from the external power source (100) to the one of the air conditioners (10) was restarted, based on the signal transmitted from the indoor control unit (C). The remote controller (RC) obtains the first time based on the first time of day and the second time of day. The control unit (C) makes the determination in Step S16 described above, based on the first time.

[0108] In the third variation, control of the present disclosure can be performed without a first internal power source (54) for each air conditioner (10).

(7-4) Fourth Variation

[0109] In a fourth variation, if the first time is not equal to or longer than the predetermined time T_s in Step S16 of the embodiment, the display (41), which is the notification unit, notifies the user of second information as shown in Step S19 in FIG. 10. Examples of the second information include messages such as "unplugged," "power supply has temporarily stopped," and "power supply has

stopped for a period shorter than the predetermined time T_s ." It can be said that the second information is information indicating a lower degree of risk than the first information. In the fourth variation as well, if the first time is not equal to or longer than the predetermined time T_s , the control unit (C) does not prohibit the operation of the air conditioner (10).

(7-5) Fifth Variation

[0110] In the embodiment described above, the management device (70) is provided for the air conditioner (10). However, the management device (70) may be employed for a terminal device, a server, or a centralized management device that can communicate with the air conditioner (10). The management device (70) may be provided in any one of the air conditioner (10), the terminal device, the server, and the centralized management device, or may be provided for two or more of these devices. The programs in the embodiment described above may be stored in a storage of the terminal device, the server, or the centralized management device. Variations of the management device (70) will be illustrated below.

(7-5-1) Type A of Fifth Variation

[0111] A management device (60) of type A of the fifth variation illustrated in FIG. 11 includes a server (71) and an air conditioner (10). The server (71) and the air conditioner (10) are connected to a network (N) in a wired or wireless manner. The server (71) is provided with a server control unit (72). The air conditioner (10) is provided with an air conditioning control unit (73). The server control unit (72) and the air conditioning control unit (73) form a control unit (C). The server control unit (72) and the air conditioning control unit (73) each include a micro control unit (MCU), an electric circuit, and an electronic circuit. The MCU includes a central processing unit (CPU), a memory, and a communication interface. The memory stores various programs to be executed by the CPU. The remote controller (RC) is provided with a display (41) as a notification unit.

[0112] The control unit (C) execute a process for notifying the user of first information when power supply to the air conditioner (10) is restarted after a time equal to or longer than a predetermined time has elapsed since the stopping of the power supply to the air conditioner (10).

[0113] Specifically, when the power supply to the air conditioner (10) is restarted, the server control unit (72) determines whether or not the first time during which the power supply stops is equal to or longer than the predetermined time T_s , as in the embodiment described above. The first time may be measured by a timer in the air conditioner (10) or a timer in the server (71). If the first time is equal to or longer than the predetermined time T_s , the server control unit (72) causes the server (71) to output a first signal to the air conditioner (10). When the

air conditioner (10) receives the first signal, the air conditioning control unit (73) causes the display (41) to show first information. It is thus possible to make the user recognize the risk at the restart of the power supply to the air conditioner (10) if the risk has increased because the user removed the plug (51) of the air conditioner (10) from the socket (5).

[0114] When the air conditioner (10) receives the first signal, the air conditioning control unit (73) prohibits the operation of the air conditioner (10). It is thus possible to reliably prevent the air conditioner (10) from being operated in the same high-risk state, if the risk has increased because the user removed the plug (51) of the air conditioner (10) from the socket (5).

(7-5-2) Type B of Fifth Variation

[0115] A management device (70) of type B of the fifth variation illustrated in FIG. 12 includes a terminal device (74). The terminal device (74) is, for example, a smartphone, a tablet terminal, or a personal computer. The terminal device (74) and the air conditioner (10) are connected to each other by a third transmission line (W3) that is wired or wireless. The terminal device (74) is provided with a terminal control unit (75). The air conditioner (10) is provided with an air conditioning control unit (73). The terminal control unit (75) and the air conditioning control unit (73) form a control unit (C). The terminal control unit (75) and the air conditioning control unit (73) each include a micro control unit (MCU), an electric circuit, and an electronic circuit. The MCU includes a central processing unit (CPU), a memory, and a communication interface. The memory stores various programs to be executed by the CPU. The terminal device (74) is provided with a display (41) as a notification unit.

[0116] When the power supply to the air conditioner (10) is restarted, the terminal control unit (75) determines whether or not the first time during which the power supply stops is equal to or longer than the predetermined time T_s , as in the embodiment described above. The first time may be measured by a timer in the air conditioner (10) or a timer in the terminal device (74). If the first time is equal to or longer than the predetermined time T_s , the terminal control unit (75) causes the display (41) of the terminal device (74) to show the first information. If the first time is equal to or longer than the predetermined time T_s , the terminal control unit (75) causes the terminal device (74) to output a first signal to the air conditioner (10). When the air conditioner (10) receives the first signal, the air conditioning control unit (73) prohibits the operation of the air conditioner (10).

(7-5-3) Type C of Fifth Variation

[0117] A management device (70) of type C of the fifth variation has the same basic configuration as that of type B of the fifth variation. In type C of the fifth variation, when

the power supply to the air conditioner (10) is restarted, the air conditioning control unit (73) determines whether or not the first time during which the power supply stops is equal to or longer than the predetermined time T_s . The first time may be measured by a timer in the air conditioner (10) or a timer in the terminal device (74). If the first time is equal to or longer than the predetermined time T_s , the air conditioning control unit (73) causes the air conditioner (10) to output a first signal to the terminal device (74). When the terminal device (74) receives the first signal, the terminal control unit (75) causes the display (41) of the terminal device (74) to show first information. If the first time is equal to or longer than the predetermined time T_s , the air conditioning control unit (73) prohibits the operation of the air conditioner (10).

(8) Other Embodiments

[0118] The air conditioner (10) is of a pair type that includes one indoor unit (30) and one outdoor unit (20). However, the air conditioner (10) may be of an indoor multi-type having two or more indoor units (30) or an indoor multi-type having two or more outdoor units (20).

[0119] The air conditioner (10) may be a ventilator configured to provide air ventilation, an air purifier configured to purify air, or a humidity control apparatus configured to humidify or dehumidify air. In other words, the "air conditioning" described herein means not only temperature control of air, but also ventilation of air, purification of air, and humidity control of air.

[0120] The air conditioner (10) may further include a countermeasure device against the refrigerant leakage. The countermeasure device includes, for example, a fan configured to agitate air, a ventilator configured to provide air ventilation, and a shutoff valve configured to close the refrigerant pipe when the refrigerant leakage is detected. The fan may be an indoor fan (32).

[0121] The notification unit configured to give a notification of the first information does not have to be the display (41). The notification unit may be a unit configured to emit a voice representing the first information.

[0122] While the embodiment and variations thereof have been described above, it will be understood that various changes in form and details may be made without departing from the spirit and scope of the claims. The elements according to the embodiment, variations thereof, and the other embodiments may be combined and replaced with each other.

[0123] The ordinal numbers such as "first," "second," "third," ... , described above are used to distinguish the terms to which these expressions are given, and do not limit the number and order of the terms.

INDUSTRIAL APPLICABILITY

[0124] As can be seen from the foregoing description, the present disclosure is useful for an air conditioner, a management device for an air conditioner, and a pro-

gram.

DESCRIPTION OF REFERENCE CHARACTERS

[0125]

- 10 Air Conditioner
- 35 Refrigerant Leakage Sensor (Sensor)
- 41 Display (Notification Unit)
- 70 Management Device
- C Control Unit

Claims

1. An air conditioner comprising:
a notification unit (41) configured to notify a user of
first information if power supply to the air conditioner
(10) is restarted after a time equal to or longer than a
predetermined time has elapsed since stopping of
the power supply to the air conditioner (10). 15
2. The air conditioner of claim 1 further comprising:
a control unit (C) configured to prohibit operation of
the air conditioner (10) if the power supply to the air
conditioner (10) is restarted after a time equal to or
longer than the predetermined time has elapsed
since the stopping of the power supply to the air
conditioner (10). 20
3. The air conditioner of claim 1 or 2, wherein
the predetermined time is 200 hours. 25
4. The air conditioner of claim 2, wherein
the control unit (C) cancels prohibition of the opera-
tion of the air conditioner (10) when a command
associated with operation of a manufacturer, a dis-
tributor, or a service provider is input to the control
unit (C). 30
5. The air conditioner of claim 2, wherein
the control unit (C) cancels prohibition of the opera-
tion of the air conditioner (10) when a predetermined
cancel code is input to the control unit (C). 35
6. The air conditioner of claim 5, wherein
the cancel code is information which will be given to
the user by a manufacturer, a distributor, or a service
provider after the power supply to the air conditioner
(10) is restarted. 40
7. The air conditioner of any one of claims 1 to 6,
wherein
the first information includes information indicating
that a time equal to or longer than the predetermined
time has elapsed since the stopping of the power
supply to the air conditioner (10). 45
8. The air conditioner of any one of claims 1 to 7, 50

wherein

the first information includes information urging con-
tact with a manufacturer, a distributor, or a service
provider.

9. The air conditioner of any one of claims 1 to 8,
wherein
the first information includes a contact address of a
manufacturer, a distributor, or a service provider. 5
10. The air conditioner of any one of claims 1 to 9 further
comprising:
a sensor (35) configured to detect leakage of a
refrigerant. 10
11. A management device for an air conditioner, the
management device comprising:
a notification unit (41) configured to notify a user of
first information if power supply to the air conditioner
(10) is restarted after a time equal to or longer than a
predetermined time has elapsed since stopping of
the power supply to the air conditioner (10). 15
12. A program that executes a process for notifying a
user of first information if power supply to an air
conditioner (10) is restarted after a time equal to or
longer than a predetermined time has elapsed since
stopping of the power supply to the air conditioner
(10). 20

FIG.1

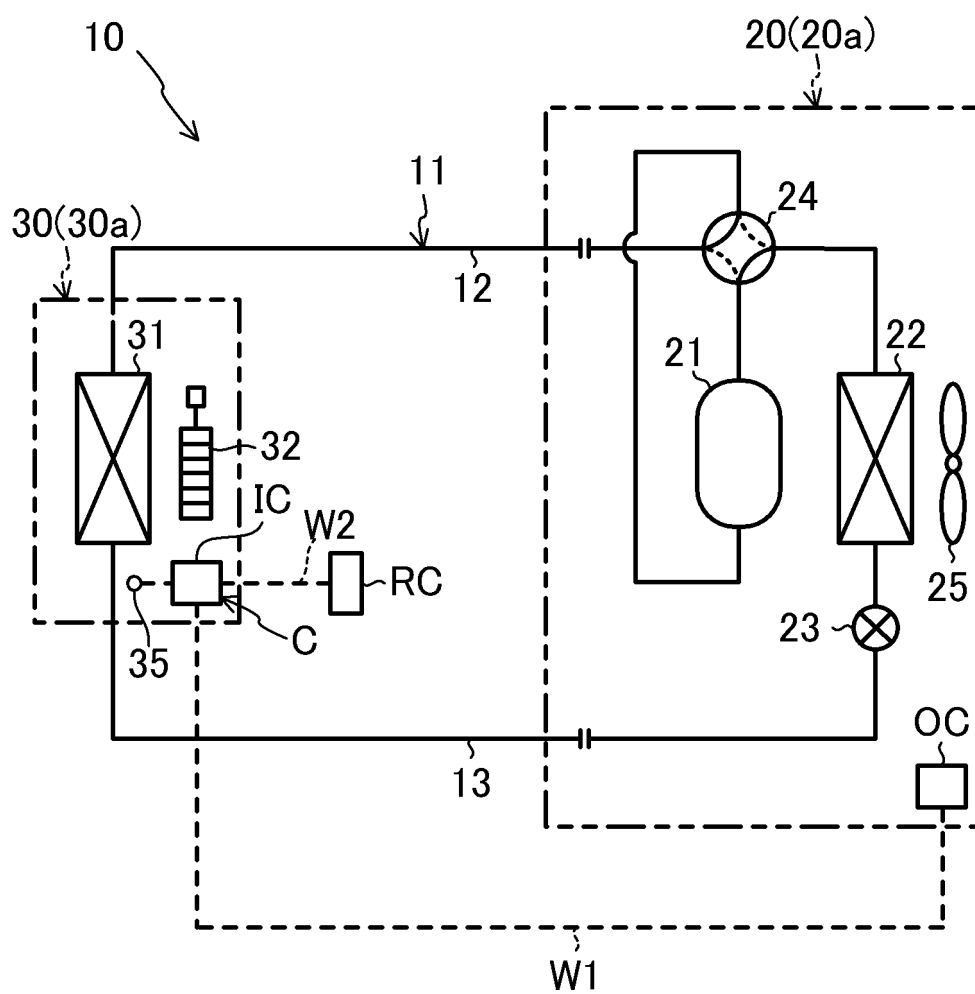


FIG.2

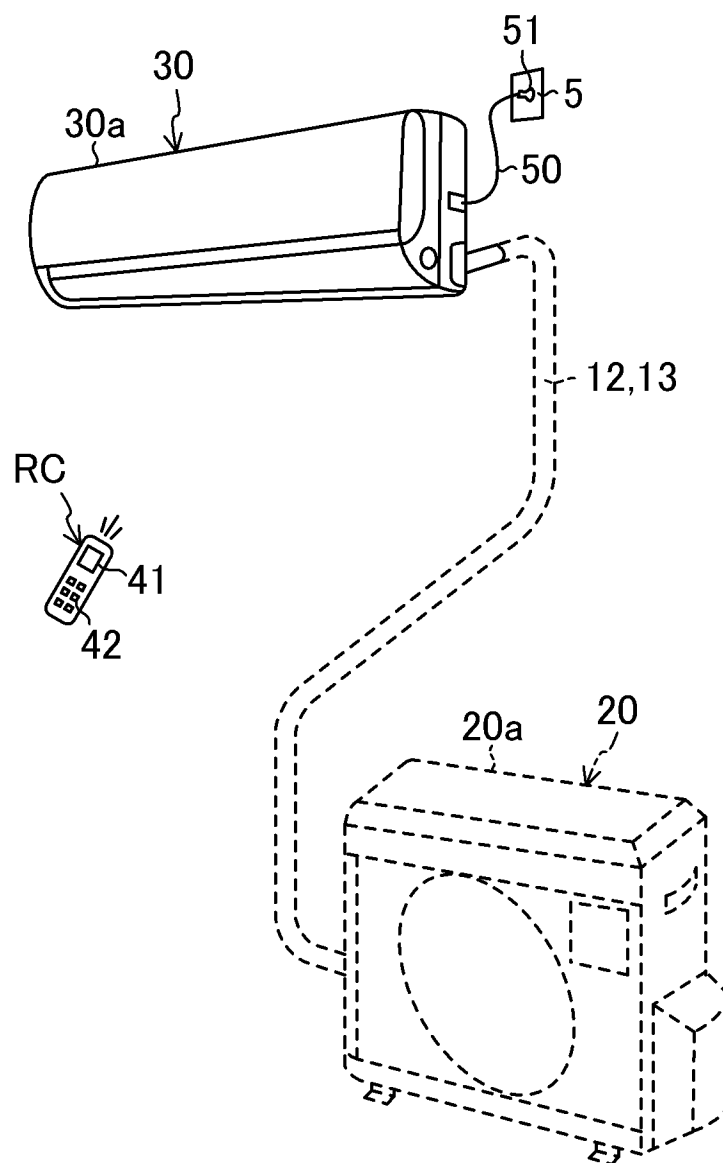


FIG.3

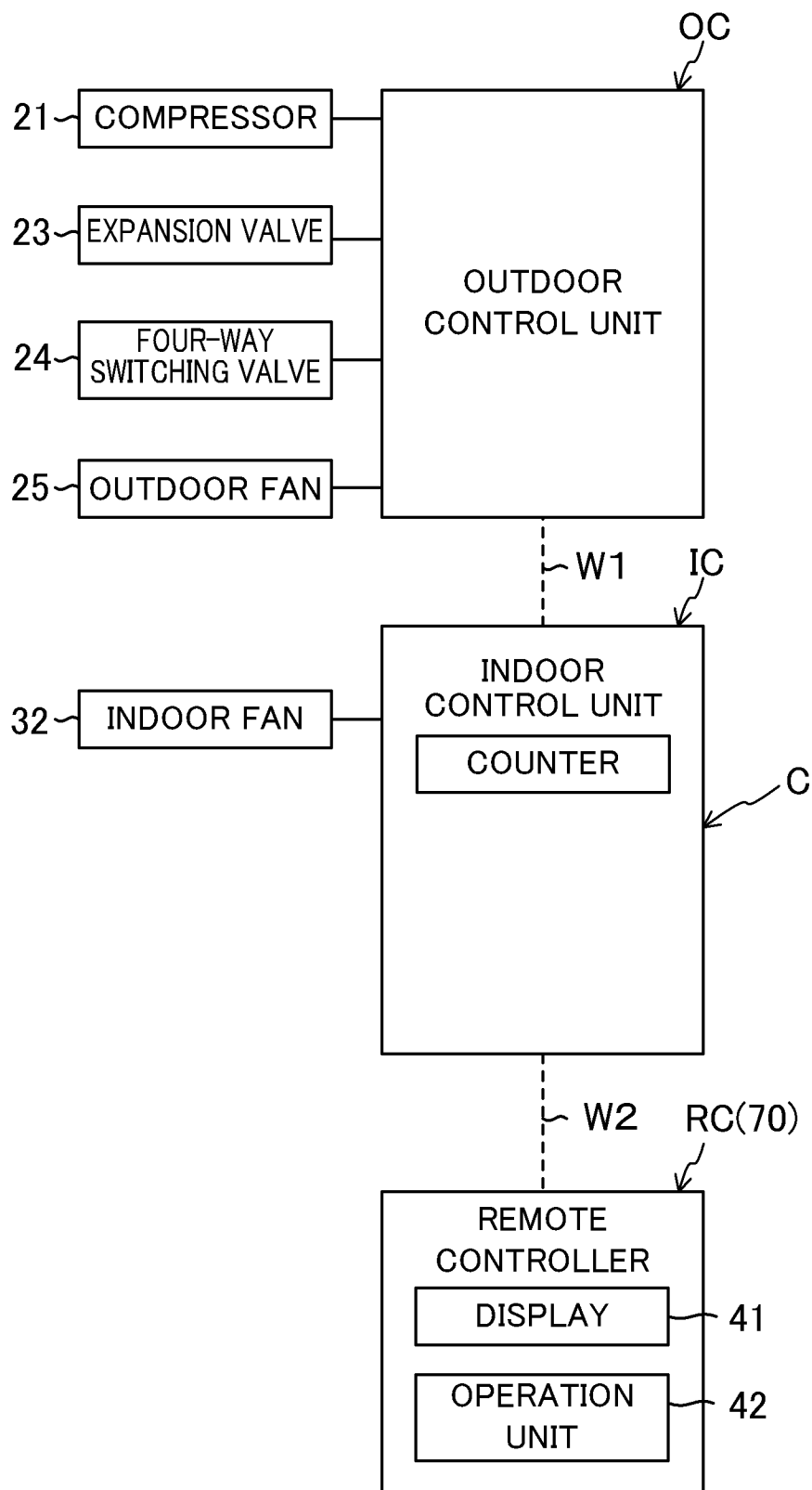


FIG.4

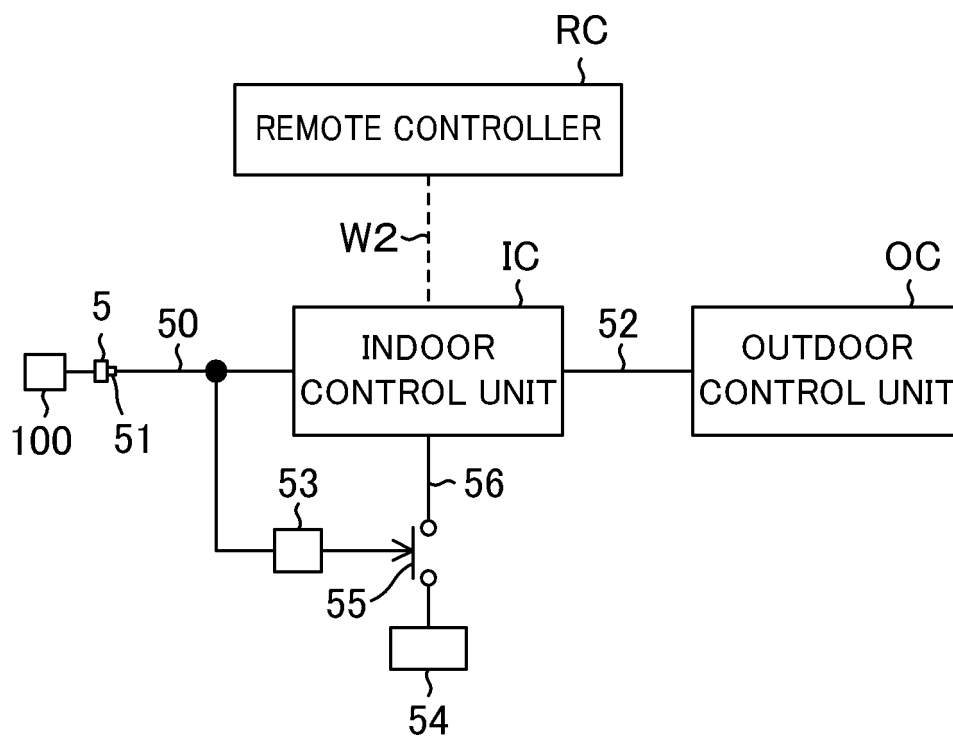


FIG.5

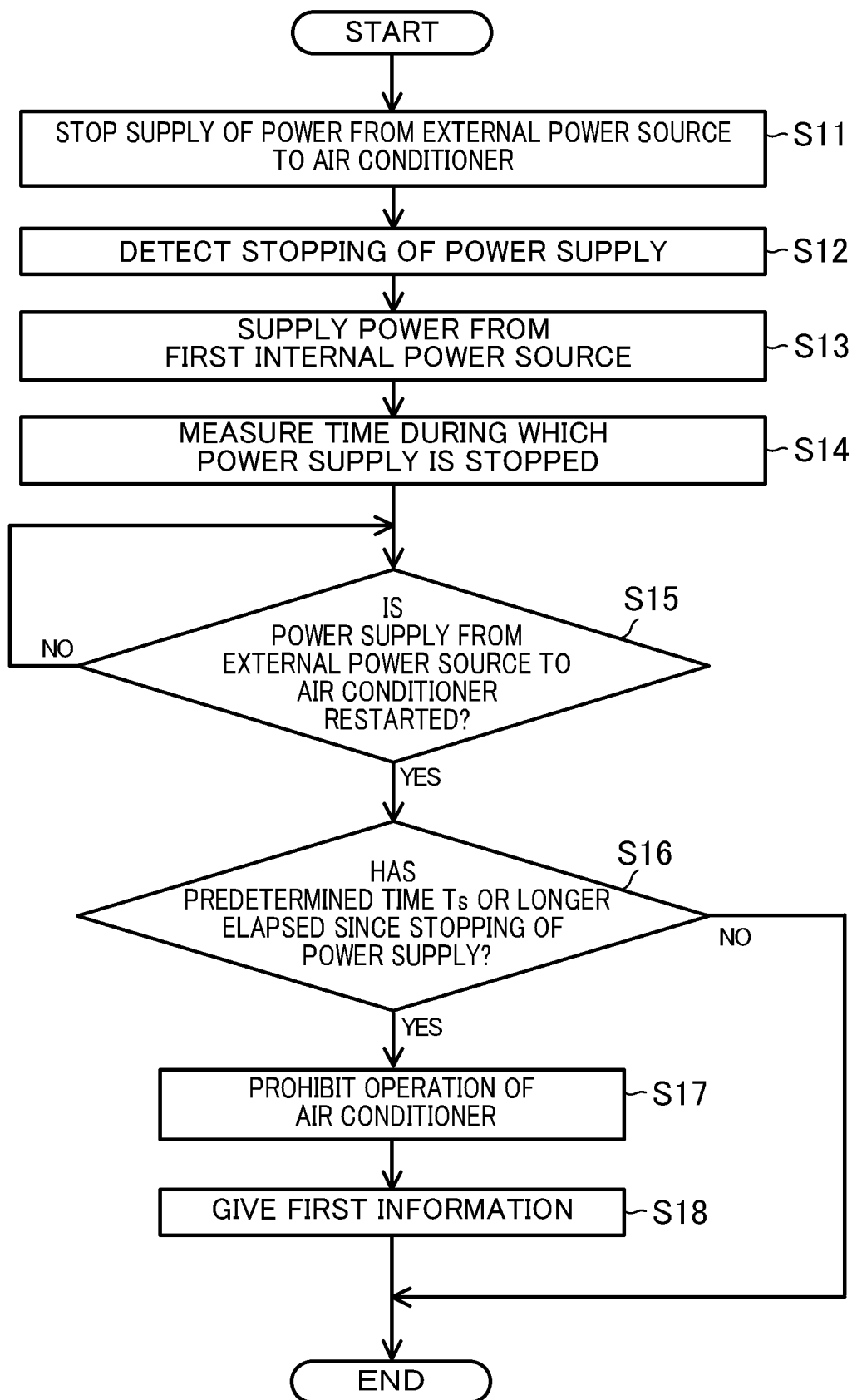


FIG.6

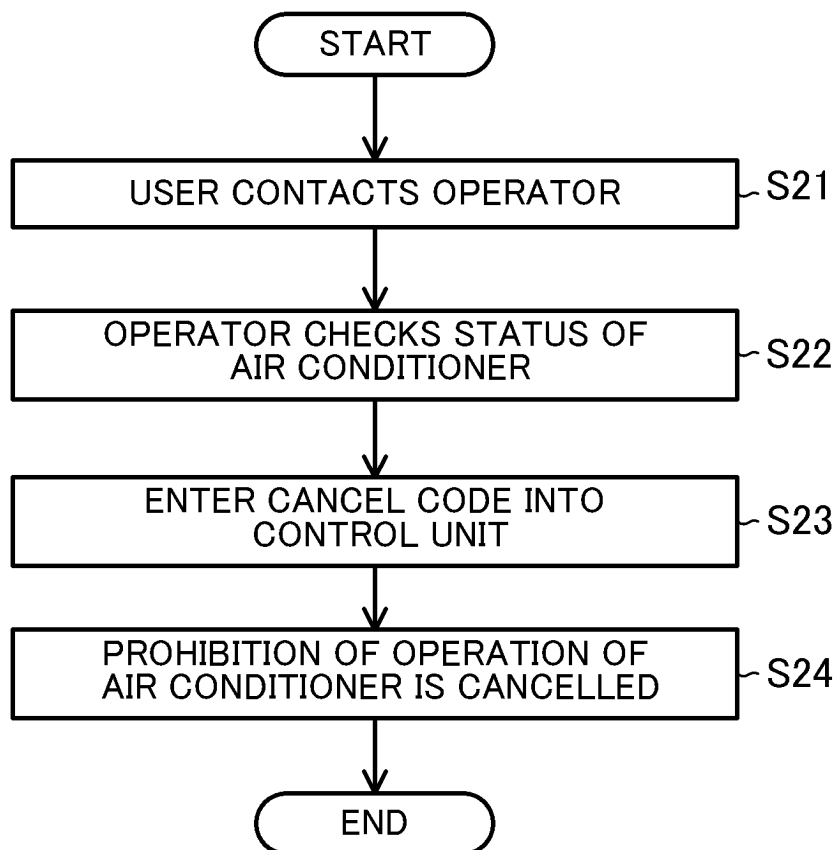


FIG.7

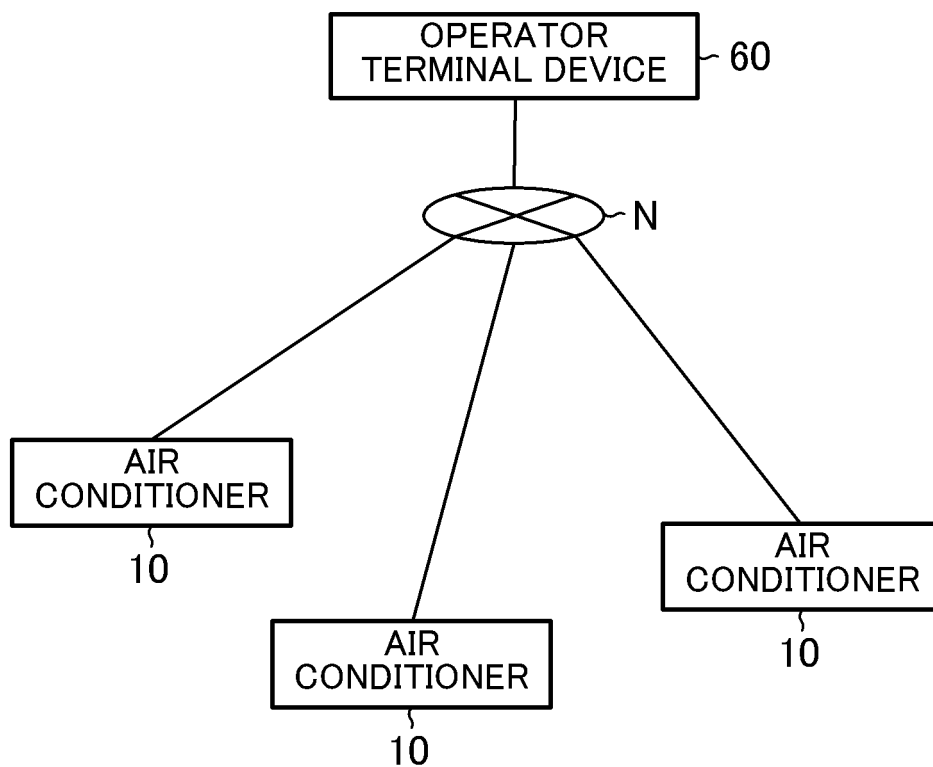


FIG.8

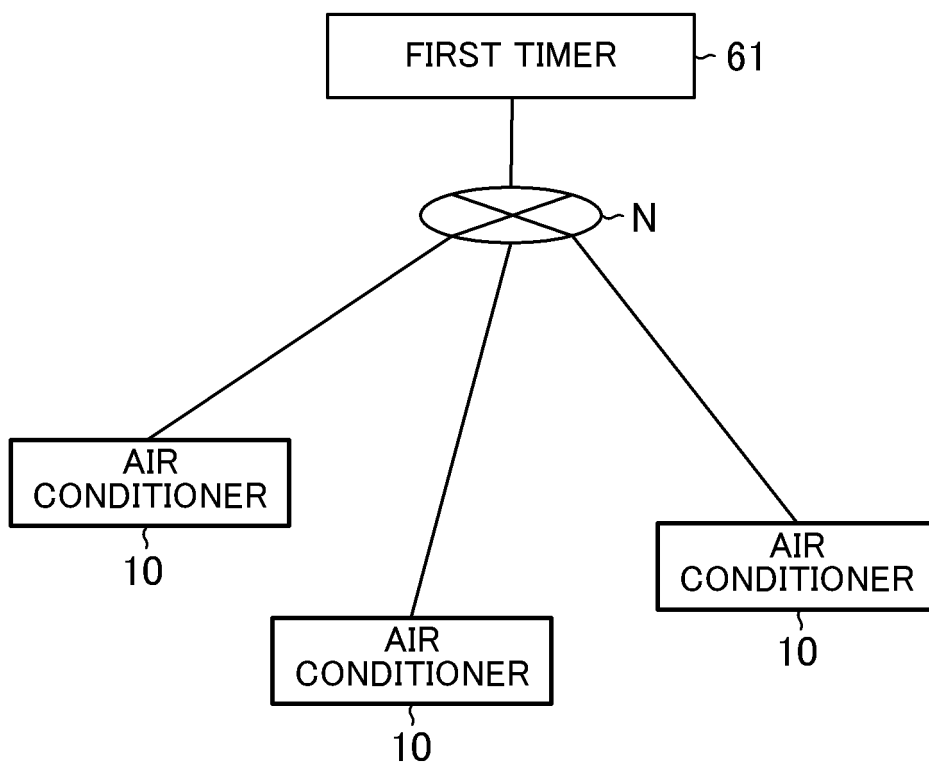


FIG.9

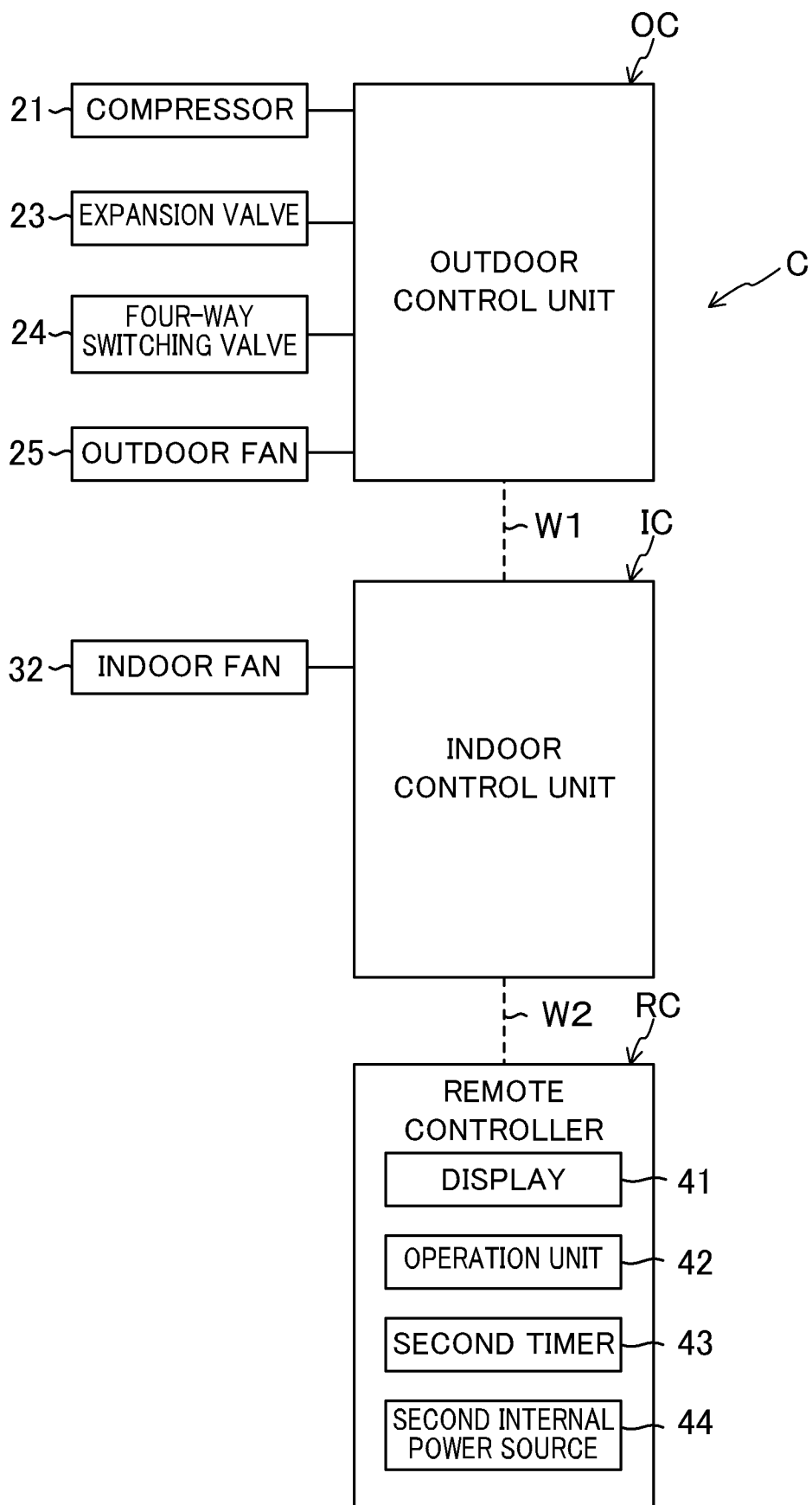


FIG.10

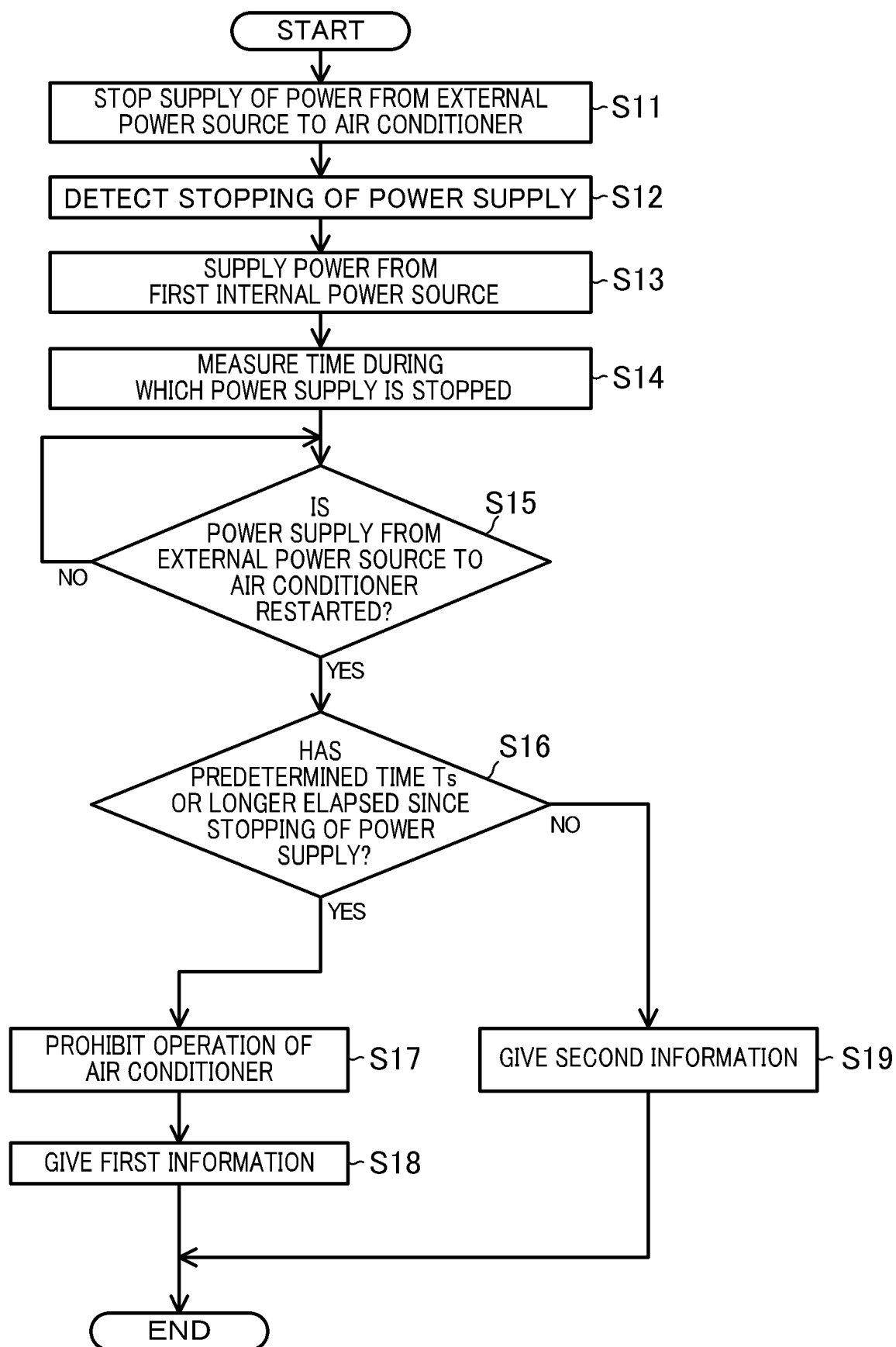


FIG.11

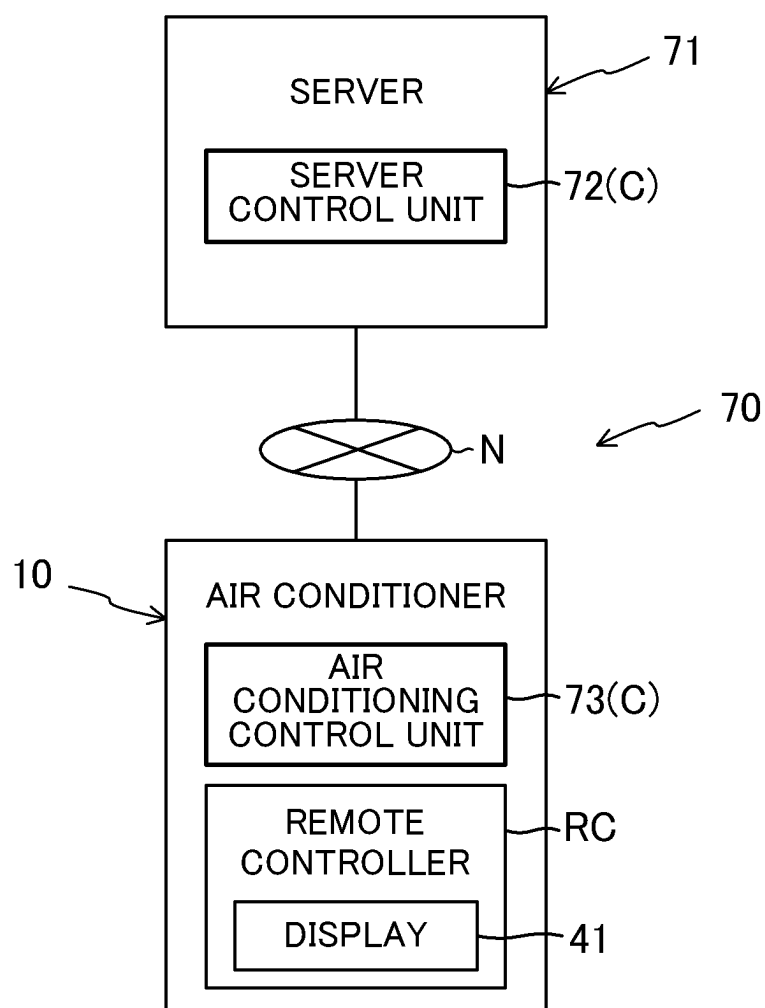
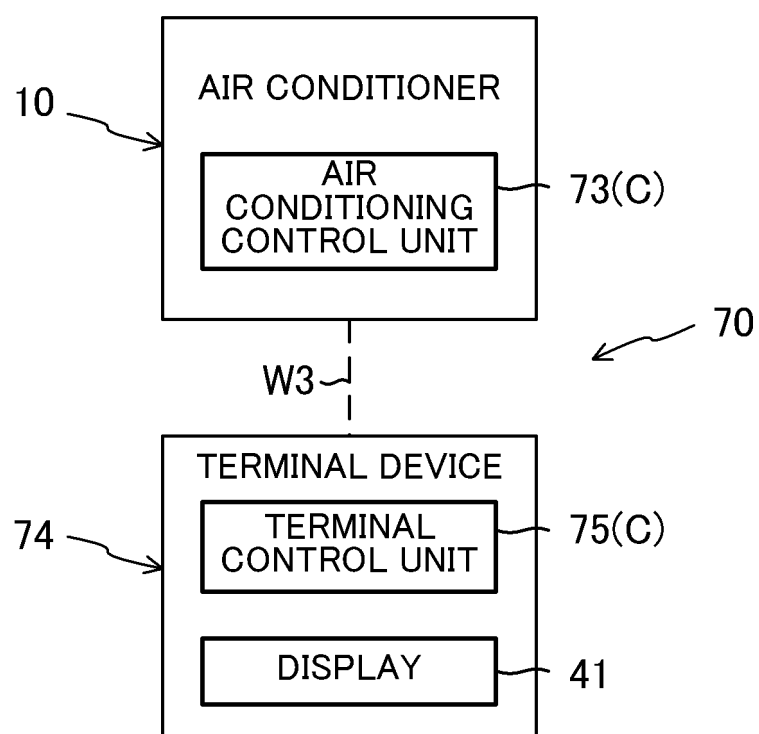


FIG.12



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2023/024484

A. CLASSIFICATION OF SUBJECT MATTER

F24F 11/36(2018.01)i; **F24F 11/52**(2018.01)i; **F24F 11/56**(2018.01)i
FI: F24F11/36; F24F11/52; F24F11/56

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F24F11/36; F24F11/52; F24F11/56

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan 1922-1996
Published unexamined utility model applications of Japan 1971-2023
Registered utility model specifications of Japan 1996-2023
Published registered utility model applications of Japan 1994-2023

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 08-178391 A (MATSUSHITA ELECTRIC IND CO LTD) 12 July 1996 (1996-07-12) paragraphs [0007]-[0029], fig. 1-12	1, 3, 11-12
Y		2-10
Y	JP 64-057036 A (TOSHIBA CORP) 03 March 1989 (1989-03-03) p. 2, upper right column, line 10 to p. 3, upper right column, line 17, fig. 1-2	2-10
Y	JP 2013-029302 A (MITSUBISHI ELECTRIC CORP) 07 February 2013 (2013-02-07) paragraphs [0033]-[0035], fig. 8	8-10
Y	JP 2016-191506 A (DAIKIN IND LTD) 10 November 2016 (2016-11-10) paragraphs [0022]-[0059], fig. 1-9	10
A	CN 110044033 A (GUANGDONG MIDEA REFRIGERATION EQUIPMENT CO., LTD.) 23 July 2019 (2019-07-23) entire text, all drawings	1-12

☐ Further documents are listed in the continuation of Box C.
 ☒ See patent family annex.

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"E" earlier application or patent but published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

29 August 2023

Date of mailing of the international search report

12 September 2023

Name and mailing address of the ISA/JP

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Japan

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/JP2023/024484

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JP 08-178391 A	12 July 1996	(Family: none)	
JP 64-057036 A	03 March 1989	(Family: none)	
JP 2013-029302 A	07 February 2013	US 2012/0318010 A1 paragraphs [0082]-[0088], fig. 8	
		EP 2538147 A2	
		CN 102840646 A	
		KR 10-2012-0140209 A	
JP 2016-191506 A	10 November 2016	(Family: none)	
CN 110044033 A	23 July 2019	WO 2020/220452 A1 entire text, all drawings	

Form PCT/ISA/210 (patent family annex) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

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- JP 2016191506 A [0003]